

# THE SCIENCE OF MAKING...

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## TECHNICAL ACHIEVEMENTS



### DEVELOPMENT OF LOW-TEMPERATURE WAX INJECTION UNIT TO MINIMISE SHRINKAGE OF WAX PATTERN IN INVESTMENT CASTING

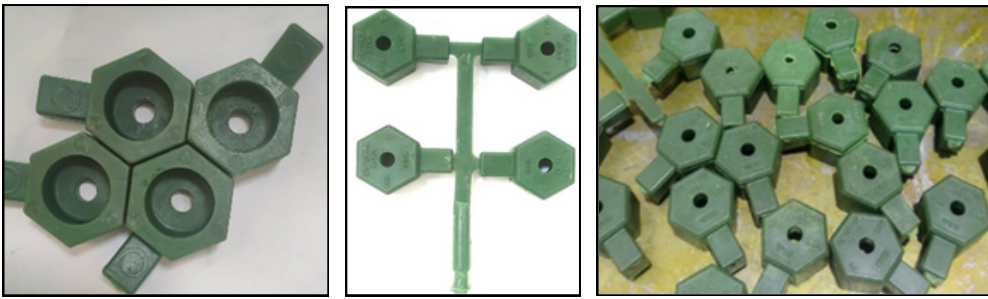
Investment casting is a sophisticated industrial manufacturing process that expertly combines precision and craftsmanship. In this method, intricately designed wax patterns are repeatedly immersed in a refractory slurry, forming a durable ceramic, plaster, or plastic shell around them. Once the shell has cured and solidified, the wax is meticulously melted away, allowing molten metal to be poured into the cavity and ultimately creating the final casting. This technique is particularly valued for its ability to produce complex components that require not only tight dimensional tolerances but also exceptional surface finishes. The quality of the resultant cast component is profoundly influenced by the accuracy and surface finish of the wax pattern. Several critical factors come into play when assessing the quality of wax patterns, including linear shrinkage, surface roughness, and hardness. Notably, shrinkage can significantly impact achieving the desired dimensional precision. To address the challenges posed by shrinkage, injecting wax at lower temperatures below 50°C is a recommended strategy. To address this challenge, the Indian OEM wax injection moulding machine approached CMTI, and this R&D was supported by the MHI CG scheme, as part of the ongoing

Industry Accelerator at CMTI. We undertook this development work: developing and testing a low-temperature wax injection unit, which was then integrated onto the injection moulding machine provided by the same manufacturer. This innovative machine enables the precise injection of wax in paste form and can operate effectively at temperatures up to 48°C. Additionally, the machine has been upgraded with smart features that monitor its status and the injection process, allowing for faster injection rates into the patterns. Such advancements not only foster the production of high-quality wax patterns with significantly reduced shrinkage but also enhance the overall precision and reliability of investment cast components, setting a new manufacturing practice.



**SMART LOW-TEMPERATURE WAX INJECTION MACHINE DEVELOPED**

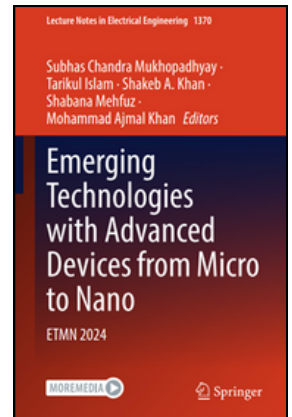




**WAX PATTERNS MOULDED AT 48°C BY THE MACHINE DEVELOPED AT CMTI**

## PUBLICATIONS

- A paper titled "Non-Intrusive Load Monitoring using Power Signature Analysis: An adaptive AI Approach" authored by Sharada Rudrakshimath, Setti Suresh, T Narendra Reddy, Prakash Vinod, and Geetha Chakaravarthi, is accepted for publication in IEEE 4th International Conference on Smart Technologies for Power, Energy, and Control (STPEC 2025).
- A book chapter titled "Modelling the Influence of Corrugations on the Performance of MEMS Pressure Sensor" authored by N. Kusuma, S. Harsha, Hemant Kumar Singh, and Venkatesh K. P. Rao, is included in the "Lecture Notes in Electrical Engineering 1370" in Emerging Technologies with Advanced Devices from Micro to Nano (ETMN 2024), published in Springer Nature E-Book ISBN 978-3-031-84331-0, Page 127-137.



## PRESENTATIONS/CONTRIBUTORY TALKS

- **CMTI SCIENTIST, MR. HARSHA S, DELIVERED A TALK ON "ADVANCED MICRO SYSTEMS PACKAGING AND CHARACTERIZATION TECHNIQUES"**

Mr. Harsha S, Scientist-D and Group Head (STDC), delivered a technical talk on "Advanced Micro Systems Packaging and Characterization Techniques" in the Continuing Education Program (CEP) at Microwave Tube Research and Development Centre (MTRDC), DRDO, Bengaluru, on 10 October 2025.



- **CMTI SCIENTISTS ATTEND 3D GEM-2025**

Mr. Sunil Magadam (Scientist-D & Group Head, MNM group, C-MNTM) and Dr. Debeshi Dutta (Scientist-C, C-MNTM), along with a team of project staff, comprising Mr. Kaushik G, Mr. Harikesh Sharma, and Ms. Sindhu B S, participated and presented a poster titled "Medical Nutrition 3D Food Printer" in the 3D Graphy in Engineering & Medical (3D GEM) 2025 event held on 9 & 10 October at J. N Tata Auditorium, IISc, Bengaluru.



## EVENTS/ WORKSHOPS ATTENDED

- **PARTICIPATION IN CII INNOVERGE 2025**

Mr Krishna Rathod, Sct F & Centre Head Business Development, Mr Narendra Reddy, Sct-D & Group Head, Smart Mfg, Mr Bishnu Prasad Sahu, STA-II, and Ms Mahalaxmi STA-I, attended the CII Innoverge 2025 event held from 10-11 October 2025 at The Taj West End, Bengaluru. The visit provided valuable exposure to current industrial trends, networking opportunities, and potential avenues for collaboration with leading organizations.





## ➤ CMTI PARTICIPATES IN THE INTERNATIONAL SEMINAR ON "THE FUTURE OF AEROSPACE MANUFACTURING"

- Mr. Tom Thamphy (Scientist-E & Group Head, ASL Group, C-ASMP) and Mr. Bishnu Prasad Sahu visited the International Seminar on "The Future of Aerospace Manufacturing" on 15 October 2025 at Taj Yeshwanthpur, Bengaluru. The event, organised jointly by IMTMA, India and UCIMU Italy, brought together global experts, industry leaders, and researchers to discuss emerging trends, advanced materials, automation, and next-generation manufacturing technologies in the aerospace sector.
- Dr Nagahanumaiah, Director, CMTI, delivered a keynote lecture on the "Role of R&D Institutes in Indian Aerospace and Defence Manufacturing Growth".



## ➤ CMTI TEAM VISITS M/S CG POWER INDUSTRIAL SOLUTIONS PVT. LTD., AHILYANAGAR, MAHARASHTRA



A CMTI team comprising Shri. Sreevatsa G. S., Sct-D, Shri. Anand Lavudya, Sct-B (PDE Group), and Shri. Bhoothesh S. E., Tech.-III (PAT Group), visited M/s CG Power Industrial Solutions Pvt. Ltd., Ahilyanagar, Maharashtra, on 8 and 9 October 2025 for the Factory Acceptance Test (FAT) of an 80-kW flameproof induction motor. The motor was thoroughly evaluated against its target specifications, key performance parameters, and safety criteria. The motor satisfied all specified requirements including the Temperature Rise Test and Type Test, in accordance with relevant standards. Upon completion of the evaluation.

## ➤ CMTI TEAM VISITS M/S ACEM, NASIK

CMTI team comprising Shri. Vijaykumar Nidagalkar, Sct-D, Shri. Sreevatsa G. S., Sct-D, Shri. Anand Lavudya, Sct-B (PDE Group), and Shri. Bhoothesh S. E., Tech.-III (PAT Group), visited M/s ACEM, Nasik, on 10 October 2025 to discuss queries related to the Twin Screw Continuous Mixer (TSCM). During the visit, the ACEM team facilitated a tour of the proposed installation site for the TSCM. The CMTI team assessed the location and examined the existing sub-systems available at ACEM to evaluate their feasibility for integration with the TSCM under development. The necessary modifications required for seamless integration were also discussed with the customer.



## DEMONSTRATIONS/VISITS AT CMTI

### ➤ DELEGATES FROM HITACHI AND MOBIVEIL VISIT CMTI

Delegates from Hitachi and Mobiveil visited CMTI on 13 October 2025 to discuss potential areas of collaboration : to explore ongoing research and development activities, and understand the institute's technological capabilities. The visit included interactions with key technical teams and a tour of selected laboratory facilities.





## INDUSTRIAL VISIT CONDUCTED FOR MTRDC PARTICIPANTS

Participants from MTRDC, DRDO visited CMTI from 8-9 October 2025 as part of the Continuing Education Programme (CEP) focused on the course titled “Advanced Manufacturing Process for High Frequency Vacuum Electronic Devices”. During the visit, Mr. K. Niranjan Reddy, (JD & CH, C-MNTM) delivered a guest lecture on “Current Trends in Metrology” on 8 October 2025, followed by a guest lecture by Mr. Harsha S (Scientist-D, and GH, STDC, C-SVT) on “Electronic Fabrication” on 9 October 2025. The programme also featured demonstrations of state-of-the-art technologies and guided tours of key laboratories and facilities, fostering knowledge exchange and strengthening collaboration between the organisations.

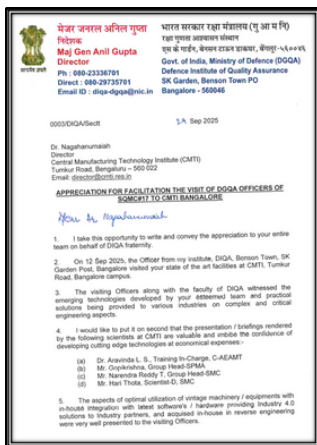


## AWARDS/RECOGNITIONS

### CMTI SCIENTIST WINS THIRD PRIZE IN MHI "HINDI PAKHWADA COMPETITION"

Mr. Mayank Patel, Scientist-B from C-SMPM, CMTI, secured the Third Prize in the Competition organized by the Ministry of Heavy Industries (MHI) during the “Hindi Pakhwada” in September 2025. His entry in Technical Article category titled “धातु का दर्पण और इन्फ्रारेड लेंस उत्पादन के लिए भारत की पहली स्वदेशी रूप से विकसित टर्निंग मशीन: नैनोशेप टी250” showcased CMTI's innovation in ultra-precision machining technology for advanced optical components.

### APPRECIATION FOR FACILITATING THE VISIT OF DGQA OFFICERS TO CMTI



A team of officers from the Defence Institute of Quality Assurance (DIQA), Ministry of Defence, Government of India, visited CMTI, Bengaluru, on 12 September 2025 to review the institute's advanced technological capabilities. During the visit, the officers, accompanied by DIQA faculty members, were introduced to CMTI's state-of-the-art facilities and emerging technologies addressing complex and critical engineering challenges.

Major General Anil Gupta, Director, DIQA, Bengaluru, on behalf of the visiting team, commended the quality of demonstrations, noting the effective integration of vintage machinery with modern hardware and software to deliver Industry 4.0 solutions. He also appreciated CMTI's advancements in reverse engineering and practical, cost-efficient solutions provided to industrial partners. The DIQA acknowledgement conveyed gratitude to CMTI's leadership and technical team for their support and valuable engagement.

## MOU'S/NDA

### CMTI SIGNS MOU WITH BITS, PILANI, GOA

An MoU was formally signed between CMTI and BITS Pilani Goa Campus on 7 October 2025, paving the way for future collaboration and innovation.





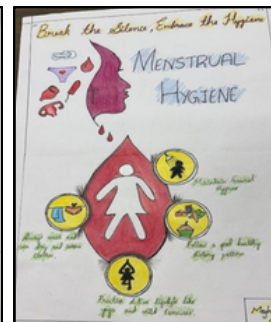
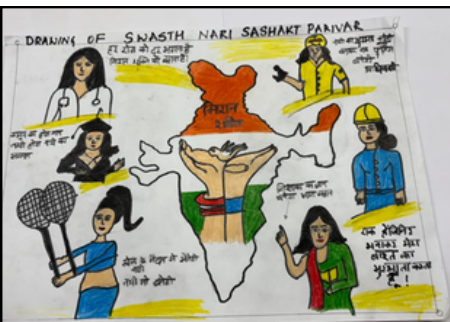
# EVENTS/CELEBRATIONS

## ➤ SWASTH NARI SASHAKT PARIVAR CAMPAIGN – 2025 AT CMTI

The Swasth Nari Sashakt Parivar Campaign – 2025 was inaugurated on 22 September 2025 at CMTI. The event commenced with a pledge administered by Dr. Nagahanumaiah, Director, CMTI, who addressed the gathering and briefed the women employees on various Women's Health Awareness initiatives and health check-up activities planned at the institute.

### The key activities included-

- Awareness Programme – 23 September 2025: An awareness session was organised under the guidance of Dr. Nagahanumaiah. Dr. Padmalatha V. V., Obstetrician & Gynaecologist, delivered an informative talk covering topics such as menstrual hygiene, PCOD, types of cancers, and their prevention, diagnosis, and treatment. The session was conducted in both online and offline modes to ensure wider participation.
- Slogan Writing Competition – 24 September 2025: A Slogan writing competition was organised on themes related to reproductive health, women's health in sustainable India, and the challenges faced by working women.
- Drawing/Poster Competition – 25 September 2025: Drawing/Poster competition was held on topics including female foeticide, adolescent health, mental health, and menstrual hygiene.
- Free Medical Health Camp – 26 September 2025 – A comprehensive medical camp was organized, offering general health check-ups, dental services, TB screening, Pap smears, and mammography for employees. Additionally, vision screening was conducted by Nidhikrishna Eye Vision, Bengaluru, and mental health awareness and screening sessions were facilitated by the Mental Health Action Trust (MHAT).



## UPCOMING TRAINING PROGRAMMES

1. "Laboratory Management & Internal Audit as per ISO/IEC 17025:2017", Course Code:4101, from 24 – 27 November 2025, at CMTI, Bengaluru.
2. "Introduction to CMM", Course Code:4105, from 19 – 21 November 2025, at CMTI, Bengaluru.
3. "Gear Engineering", Course Code:1101, from 19 – 20 November 2025, at CMTI, Bengaluru.
4. "Materials, Metallurgy & Heat Treatment of Metals and Alloys", Course Code:1307, from 18 –20 November 2025, at CMTI, Bengaluru.



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